cloud layers recorded by Hann (Meteorologische Zeitschrift, January, 1899, Vol. XVI, p. 25) all show that shallow cloudy layers may be produced by gentle overflow from the top of an ascending column of air, so that analogous clouds may be produced in various ways. We must, therefore, keep in mind the difference in origin between cap clouds and mushroom clouds.—*C. A.*

FIG. 1.—Lenticular cumulus.

FIG. 3.—Lenticular cumulus.

ABNORMAL WEATHER OVER SOUTHERN TEXAS.

By JOSEPH L. CLINE, Observer, Weather Bureau.
(Dated Corpus Christi, November 22, 1906.)

On Saturday, November 17, 1906, there was an area of low barometer over central Texas that caused abnormally high temperatures and clear weather over the southeastern portion of that State, while almost freezing and unsettled conditions prevailed over northwestern Texas. The maximum temperature on that date at Corpus Christi, was 91° F.; being 2° F. higher than the absolute maximum for the month of November since that station was established in February, 1887, and 1° to 3° F. higher than the maximum temperature for a great many of the months of July and August.

A cool wave of marked intensity followed this warm period and crost Texas on November 19. At 8 a. m.[1] of this date the barometric depression referred to above was central over the lower Rio Grande Valley, while the high barometer area and cool wave was central over southeastern Montana and extended east to the Mississippi Valley and south across the United States to central Texas, where it was raining, while it was snow-

[1] Seventy-fifth meridian time.

ing over the extreme northwestern portion of that State and over several States north of Texas. The temperature in Texas at the time ranged from 16° F. over the panhandle to 74° F. along the coast. The disturbance that was over the lower

FIG. 2.—Lenticular cumulus.

Rio Grande Valley moved east-northeast along the west Gulf coast to the Mississippi Valley and then moved northward. The cool wave, or norther, as they call it in Texas, struck Corpus Christi at 12:45 p. m. of the 19th, when the wind suddenly shifted from the east to the northwest, and rapidly increased in velocity, causing the temperature to fall nearly 20° F. in two hours. The accompanying dense black cloud, that always warns the inhabitants of an approaching norther, came from the west-northwest, which was unusual, as they almost invariably come from the north and northwest. The cool wave, or norther, did not reach Galveston, Tex., until about 11 p. m. of the 19th. From this it can be observed that the norther struck Galveston, a station located about 200 miles east and 100 miles north of Corpus Christi, ten hours after it struck the latter city, which is unusual, as they generally strike the former station about the same time and sometimes earlier than the latter.

The temperature at 8 p. m. of the 19th was 48° F. at Corpus Christi, while it was 74° F. at Galveston, and the writer, during his fourteen years' service in Texas, has never observed such conditions prior to this time.

The temperature at Corpus Christi fell from a maximum of 77° F. on the 19th to a minimum of 37° F. on the 20th. Such sudden and decided changes are rare over southern Texas. The minimum temperature at Corpus Christi on the morning of November 21 was 33° F., being the lowest temperature on record so early in the fall. Heavy frost occurred and thin ice formed almost to the Gulf shore. All tender vegetation, such as beans, cucumbers, and tomatoes, was killed in the vicinity of Corpus Christi, while cabbage, lettuce, beets, etc., were hardly damaged.

An amusing feature in connection with the cool wave was that there were many northern prospecters and homeseekers in Corpus Christi, and in conversation with citizens they would remark that they had been informed that it never froze and hardly ever frosted in southern Texas. Invariably the citizens would say: "It does not, but you people came down from the North and brought this with you".

DO CLIMATES CHANGE?

Those who are interested in climatology, as distinguished from meteorology, should have their attention directed toward the numerous excellent articles published by Prof. R. De C. Ward. Among these we have already noted a comprehensive series on the classification of climates.[1] In addition to this there is a paper on "Changes of climate", in the Popular Science Monthly for November; and a series of papers on "The characteristics of the zones", now being published in the Journal of Geography.

With regard to changes of climate Professor Ward says:

> Changes of climate in the geological past are known with absolute certainty to have taken place: periods of glacial invasions as well as periods of more genial conditions. The evidence and the causes of these changes have been discust and rediscust by writers almost without number and from all points of view. Changes in the intensity of insolation, in the sun itself, in the condition of the earth's atmosphere, in the astronomical relations of earth and sun, in the distribution of land and water, in the position of the earth's axis, in the altitude of the land, in the presence of volcanic dust, changes now in cosmic now in terrestrial conditions, have been suggested, combated, put forward again. No one of these hypotheses has prevailed in preference to others. No actual proof of the correctness of this or that theory has been brought forward. No general agreement has been reached. Under these conditions, and in view of the fact that practical climatology is concerned with climatic changes not of the geological past but of the historical present, this portion of our subject may be dismist with this brief mention.
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> There is a widespread popular belief in permanent, progressive changes of climate during a generation or two. This belief is not supported by the facts of meteorological record. Abundant evidence has been adduced in favor of secular changes of climate in historical times. Much of this is unreliable, contradictory, and has been interpreted without sufficient regard to possible controls other than climatic change. Without denying the possibility, or even the probability, of the establishment of the fact of secular changes, there is as yet no sufficient warrant for believing in considerable permanent changes over large areas. Dufour, after a thoro study of all available evidence, has concluded that a change of climate has not been proved. There are periodic oscillations of slight amount. An eleven-year period has been made out with more or less certainty for some of the meteorological elements, but it has been of no practical importance as yet. A thirty-five-year period is less uncertain, but is nevertheless of considerable irregularity, and can not as yet be practically applied in forecasting. Longer periods are suggested, but not made out. As to causes, variations in solar activity are naturally receiving attention, and the results thus far are promising. But climate is a great complex, and complete and satisfactory explana-

[1] Monthly Weather Review, September, 1906, Vol. XXXIV, p. 416.